Draw a Simple Bone on Graph Paper: Grid Outline with Joint Ends

Original tasks 1, 2, 3 / complete keys

Task 1

Draw a bone with a shaft three cells long and two cells wide. Each joint end extends two cells above and two cells below the shaft and two cells outward from the shaft end. What is the total length?

Answer: Seven cells.

Reason: The shaft is three cells. Each joint end adds two cells of horizontal length, so two joint ends add four cells. Three plus four equals seven.

Check: Count the shaft cells, then count the two cells added by each lobe, and add the three numbers.

Task 2

A practice box is ten cells tall. A bone has joint ends that extend two cells above and two cells below a two-cell shaft. Assume the bone is centered vertically with equal top and bottom margins. How many cells of margin are above and below the bone?

Answer: Two cells above and two cells below (four cells total).

Reason: The bone height is two cells of shaft plus two above plus two below, which is six cells. Ten minus six leaves four cells of margin, split equally as two cells above and two cells below.

Check: Add the bone height to the top and bottom margins and confirm the sum equals the box height.

Task 3

You draw a bone eight cells long in a twelve-cell-wide box. How many cells of margin are on each side if it is centered?

Answer: Two cells on each side.

Reason: Twelve minus eight equals four cells of total margin. Split equally, that is two cells on each side.

Check: Add the left margin, bone length, and right margin; the sum should equal the box width.

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Original tasks 4 / complete keys

Task 4

A bone outline has a shaft two cells wide. At the left joint the shaft measures two cells, in the middle it measures three cells, and at the right it measures two cells. Is the outline valid under the convention?

Answer: No, because the middle shaft width is three cells instead of two.

Reason: The convention requires a constant two-cell shaft width. The middle measurement differs, so that segment must be redrawn.

Check: Measure the shaft width at three points and compare the counts; all three should match.

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Source rubric / reflection

- [ ] Shaft is a straight band two cells wide and four cells long.
- [ ] Left and right joint ends each extend two cells above and two cells below the shaft.
- [ ] Total bone length is eight cells and the outline is closed.
- [ ] Bone is centered in the practice box with equal margins.
- [ ] No internal detail lines or dog-bone shape; rounded lobes stay within the counted boundary.

Reflection: What did you check, what did you change, and what will you try next?